OVERCURRENT PROTECTION RELAY

RV-I

GENERAL MODEL

USER'S HANDBOOK

0.- INDEX

0.- INDEX II

1 OBJECT 1

2 RANGE 1

3 OPERATING PRINCIPLES 1

4 RECEPTION & STORAGE 1

5 OPERATIONAL CHARACTERISTICS 1
5.1.- PROTECTIVE FUNCTIONS 1
5.2.- RELAY SETTING 2
5.3.- OUTPUTS 2
5.4.- DIGITAL INPUT 2
5.5.- CURRENT INPUTS 2
5.6.- LED'S 3
5.7.- SELF DIAGNOSIS 3
5.8.- COMMUNICATIONS 3

6 TECHNICAL CHARACTERISTICS 5

7.- OPERATING INSTRUCTIONS 10
7.1.- USER INTERFACE 10
7.2.- KEYBOARD FUNCTIONS 11
7.3.- RELAY ADJUSTMENT & MENU SEQUENCE 11
7.4.- ALARM SCREEN 16
7.5.- COMMUNICATION PROBLEMS 16

8.- CONSTRUCTION FEATURES 17

9.- POSITION OF EXTERIOR TERMINALS 18

10.- EXTERNAL CONNECTIONS 20

11.- OUTSIDE DIMENSIONS 26

APPENDIX I: MODEL SELECTION TABLE 27

APPENDIX II: CHARACTERISTICS CURVES 28

APENDIX III: OPERATING GUIDE LINE 34

1

OBJECT

This manual is intended to help users set up and operate the RV overcurrent protection relay

(**RV-I**).

2

RANGE

The new family of overcurrent protection relays, RV comprises the following models:

- RV-ITN: Overcurrent protection relay 3 phases + neutral.
- RV-IBN: Overcurrent protection relay 2 phases + neutral.
- RV-IT: Overcurrent protection relay 3 phases.
- RV-IMA: Single-phase overcurrent protection relay with armonic filter.

3

OPERATING PRINCIPLES

The **RV-I** is an overcurrent protection relay with instantaneous (50) and time (51) trip characteristics, designed to protect equipment and facilities of grounding (homopolar) or short-circuit faults between phases.

It provides RMS measure of each phase controled and records information of the last fault. Its small size makes the **RV-I** ideal for applications and facilities requiring highly compact equipment.

It can be installed quickly and easily on a 35 mm rail as per DIN EN 50022.

4

RECEPTION & STORAGE

The **RV-I** protection relay is supplied with packaging capable of protecting it during normal handling for equipment of this type.

If it is not to be installed immediately, it should be kept in the packaging, properly closed and in indoor conditions, protected from rain, dust, vibration, etc.

If the packaging is damaged or it is believed that the unit may have been incorrectly handled in transit, the carrier, the relevant insurance company and the manufacturing plant should be informed forthwith.

Check also that the data on the ID plate matches the order data.

5

OPERATIONAL CHARACTERISTICS

5.1.- Protective Functions

The **RV-I** protection relay features the following protective functions for phase and neutral:

- Instantaneous unit (50):
  - Instantaneous operation.
  - Additional time.
- Time unit (51):
  - Definite time.
  - Operation by curves:
    - Inverse.
    - Very inverse.
    - Extremely inverse.
    - Customer's special curve (optional).

5.2.- Relay setting

The relay can be adjusted:

- Via the display and keyboard on its front (user interface).
- Via a local PC using the RS-232 port on the front of the relay.
- Via the RS-485 port, through the connection terminals.

5.3.- Outputs

The **RV-I** protection relay has two or three output relays (depending on the model) whose function can be configured by the user from the following range of options:

Selection	Function
0	Relay disabled
1	General tripping
2	Phase instantaneous
3	Neutral instantaneous
4	Phase timed
5	Neutral timed
6	Phase start-up
7	Neutral start-up
8	Instantaneous disabled
9	Phase tripping (instantaneous or timed)
10	Neutral tripping (instantaneous or timed
11	Instantaneous tripping (phase and neutral)
12	Timed tripping (phase and neutral)
13	Alarm indicating RV-I not operational. In normal circumstances with the RV-I relay operational the output relay is powered up.

5.4.- Digital input

The relay has a digital input whose function can be configured by the user from the following range of options:

Option	Function
0	Disabled
1	Trip Disabled. It disables all trips and overrides ongoing trips.
2	RESET of the trip signal and last fault data.

5.5.- Current Inputs

These are powered by an external current transformer which adjusts the primary current to the secondary measuring current of the relay (see connection diagrams in Section 10). This instrument transformer should be powerful enough to power the measuring circuit (see Section 6: Technical Characteristics).

The **RV-I** overcurrent relay can be connected directly, with no need for external current transformers, in circuits with rated current levels coincidental whith the relay itself. The maximum current levels are shown in section 6 (Technical Characteristics).

5.6.- LED's

Apart from the display itself the RV-I relay has 9 LED's on its front panel:

Text	Colour	Meaning
ON	green	Relay operational
I >>	red	Instantaneous phase start-up (50)
I >> t	red	Instantaneous phase tripping
I >	red	Timed phase start-up (51)
I > t k	red	Timed phase tripping
I ⊥ **>>**	red	Instantaneous neutral start-up (50N)
I ⊥ **>>** t	red	Instantaneous neutral tripping
I ⊥ **>**	red	Timed neutral start-up (51N)
I ⊥ **>** t k	red	Timed neutral tripping

These LED's remain on until they are acknowledged manually (RESET) or via the digital input. They also act as indicators in the relay adjustment process.

5.7.- Self Diagnosis

The relay continually checks the status of its own internal components, program cycle monitoring, power supply, etc.

The results of these checks are reflected in the following two components:

- Output relay for internal failure alarm, if output option 13 is selected (see 5.3 above);
- Green "Relay Operational" indicator LED.

5.8.- Communications

The user can communicate with the protection relay to configure its operational parameters and check its status. The information communicated is as follows:

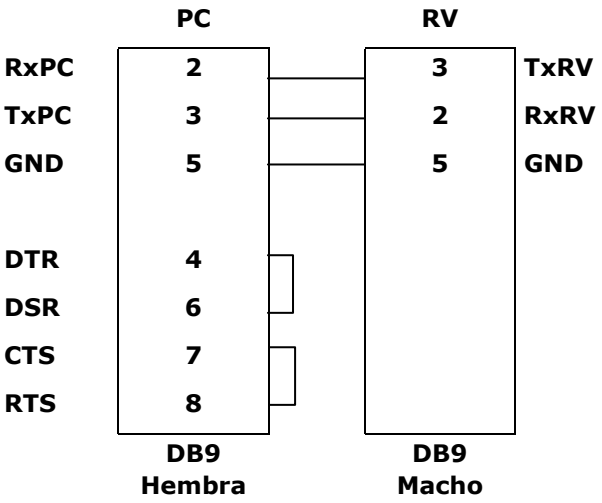
- Configuration: adjust & display of settings.
- Measurements: RMS current input levels.
- Internal status: indication of relay functions enabled, and whether they are tripped or not. The status and configuration of the relay outputs and the digital input are also shown.
- Last trip: When a trip occurs the relevant LED indicates the trip and the display reads '**FALT**'. The Up/ Down keys (1 and 3) can be used to display the currents measured in each phase at the moment when the fault occurred. This information can also be consulted via the keyboard or through the user interface until a Reset command is given through one of these channels or through the digital input.

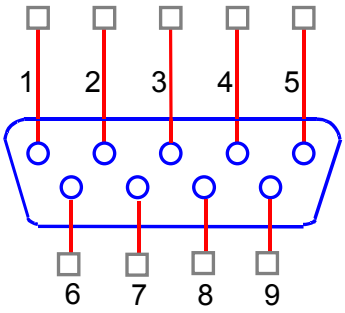
ADVICE: It is recomended to use the last version of software. Available in CD with the relay and in www.arteche.com

COMMUNICATION CHARACTERISTICS:

- Communications are based on the MODBUS-RTU protocol.
- The PC is always the master in communications, and the RS-232 port always has priority over the RS-485.
- The RS-232 port is fitted with a DB9 female connector on the front of the relay.
- Communication through the RS-485 port is via connection terminals. **This port is galvanically isolated and needs a 5 Vdc external power supply.**
- Baud rates can be configured from the keyboard or the PC. The options available are 4800, 9600 and 19200 bps. The configuration of the PC port that it is connected with the net RS485 must be like relay rated.
- The relay is allocated an ID number which can be selected between 1 and 240. This number identify each relay of an installation for MODBUS-RTU communications via RS 485. **It can be modified only through the relay keyboard, and not through communications channels**.

RS-232 CONNECTOR





6

TECHNICAL CHARACTERISTICS

Measuring rates; Setting ranges:

Instantaneous unit:

Current rated	Range	Adjust steps	Current
5 A	0.5÷60 A	0.1 A	Phase & Neutral
1 A	0.25÷15 A	0.01 A	Phase & Neutral
0.25 A	0.05÷3 A	0.01 A	Phase & Neutral
0.1 A	0.02÷1.5 A	0.01 A	Phase & Neutral
0.01 A	0.004÷0.035	0.001 A	Neutral
0.01 A (s)	0.005÷0.10	0.001 A	Neutral

Time unit:

Current rated	Range	Adjust steps	Current
5 A	0.5 ÷ 12 A	0.1 A	Phase & Neutral
1 A	0.25 ÷ 3 A	0.01 A	Phase & Neutral
0.25 A	0.05 ÷ 1 A	0.01 A	Phase & Neutral
0.1 A	0.02÷0.3 A	0.01 A	Phase & Neutral
0.01 A	0.004÷0.02	0.001 A	Neutral
0.01 A (s)	0.005÷0.03	0.001 A	Neutral

Instantaneous unit override:

Select: Yes or No.

Additional time:

Instantaneous unit:

Additional time: 0 ÷ 2 s.

Adjustment steps: 0.01 s.

Timed unit:

- Definite time: 0 ÷ 12 s.; Adjustment step 0.01 s.
- BS-IEC Curves (ANSI as an option)
  - Inverse
  - Very inverse
  - Extremely inverse
  - Customer's special curve
- Selection of K: 00 ÷ 99; Adjustment step 1.

	BS IEC	ANSI
Curve Nº	K	K
00	0.05	0.5
01	0.06	0.6
...	...	...
99	1.04	10.4

The formulae applicable to each curve model are detailed below. This enables the exact response point of the relay to be calculated.

The subsequent graphs sum up the results.

IEC 60255-3; BS-142 CURVES

$$t = \frac{k}{\left(I/Ia\right)^{a} - 1} \cdot K$$

t: trip time in seconds

I: Measured current.

Ia: Setting or start-up current.

I/Ia: nº of time setting or start-up current.

K: Multiplication factor ("time index"). Varies between 0.05 and 1.04 in steps of 0.01.

	Curve A	**Curve B**	**Curve C**
	Inverse	**Very inverse**	**Extremely inverse**
k	0.14	13.5	80
a	0.02	1	2

(See curves in Appendix II).

ANSI; IEEE C 37-2 CURVES

As an option and by special order, the **RV-I** protection relay can be pre-programmed with ANSI curves (IEEE C 37-2).

The formula and parameters involved in calculating these curves are indicated below:

$$t(s) = K \cdot \left(A + B/\left(I/Ia - C\right) + D/\left(I/Ia - C\right)^{2} + E/\left(I/Ia - C\right)^{3}\right)$$

t: trip time in seconds.

I: Measured current.

Ia: Setting or start-up current.

I/Ia: nº of time setting or start-up current.

K: Multiplication factor ("time index"). Varies between 0.5 and 10.4 in steps of 0.1.

A, B, C, D, E: Constants depending on curve type.

Cur.	**Inverse**	**Very inverse**	**Extremely inverse**
A	0.0274	0.0615	0.0399
B	2.2614	0.7989	0.2294
C	0.3000	0.3400	0.5000
D	-4.1899	-0.2840	3.0094
E	9.1272	4.0505	0.7222

(See curves in Appendix II).

MEASURING CIRCUIT

Accuracy:

Accuracy in measuring range:	± 5%
Repetition:	± 1%
Accuracy in set times:	± 5%; min. 0.03 s.
Accuracy in dependent times:	as per BS 142
Repetition:	± 1%; min. 0.03 s.

Power consumption:	< 100 mVA
Return percentage:	**>** 90 %
Max. permanent current:	3 x In (Rated current **5** A); 5 x In (rest of rates)
Max. instantaneous current:	300 A, 1 s (Rated Current **5** A). 100 A, 1 s (Rated Current **1**A and **0.25**A). 30 A, 1 s (Rated current **0.1** A) 2 A, 1 s (Rated Current **0.01** A
Instantaneous trip time:	< 50 ms (3 * adjusted $I_{inst.}$) < 60 ms (1,2 * adjusted $I_{inst.}$).

AUXILIARY POWER SUPPLY

Aux. power supply calibrations	Digital input voltage range
24-125 Vdc or 24-110 Vac; ±20%	24-125 Vdc
90-250 Vdc or 80-230 Vac; ±20%	90-250 Vdc

Power consumption: 4 ÷ 9 W

OUTPUT CONTACTS

V max.:	380 Vac, 125 Vdc
Permanent Icurrent:	10 A
Making capacity:	10 A
Breaking capacity:	Cos φ= 1: 2.500 VA; 300 W
	Cos φ= 0,4; L/R= 7 ms: 1.875 VA; 150 W
Electrical lifetime:	10^5 operations (at 1800 operations per hour).
Mechanical lifetime:	$2 * 10^7$ operations (at 1800 operations per hour).

EMC TESTS

❑ Electrostatic discharge	**EN 61000-4-2**
Air mode	15 kV
Contact mode	8 kV
❑ Radiated electromagnetic field	**EN 61000-4-3**
	10 V/m
❑ Fast transient (burst)	**EN 61000-4-4**
	4 kV / 5 kHz
❑ Impulse test voltage (surge)	**EN 61000-4-5**
Common mode	4 kV
Differential mode	2 kV
❑ Conducted disturbances induced by	**EN 61000-4-6**
radio-frequency fields	10 V
❑ Power frecuency magnetic field	**EN 61000-4-8**
permanent	100 A/m
during 1 s	1000 A/m
❑ Damped oscillatory magnetic field	**EN 61000-4-10**
at 1 MHz & 0.1 MHz	100 A/m
❑ Oscillatory waves	**EN-61000-4-12**
Common mode	2.5 kV
1 MHz differential mode	1 kV
❑ Radiated electromagnetic field	**ENV-50204**
from digital radio-telephones	10 V/m (900 MHz & 1.89 GHz)
❑ Interruptions & ripples	**IEC 60255-11**
in D/C power supply	
❑ 1 MHz disturbances	**IEC 60255-22-1**
❑ Emission	**EN 55022**

CLIMATE & ELECTRICAL SAFETY TESTS

❑ Electrical tests:	**IEC 60255-5**
Dielectric test	2 kV / 50 Hz / 1 min
High frequency	2,5 kV / 1 MHz / **IEC 60255-22-1**
	1 kV / 1 MHz / **IEC 60255-22-1**
Surge withstand	5 kV / 1.2 / 50 µs
Insulation	500 Vdc independent circuits
❑ Climate tests:	**IEC 60068-2**
Cold temperature	-20º C
Dry heat test	+60º C
Humid temp. test	+55º C, 93% humedity
Heat shock	-40º C, +80º C
Storage temp.	-30º C, +70º C
❑ Cover protection degree:	**IEC 60529, EN 60529**: IP 30

7.- OPERATING INSTRUCTIONS

7.1.- User Interface

The user interface of the relay comprises a message and data display unit, LED indicators providing various items of information and a keyboard through which commands and data are input. The characteristics of this user interface are as follows:

Four displays with 7 segments and 9 LED's. One LED is green (OK) and indicates that the protection relay is operating correctly. The full list of LED indications is as follows:

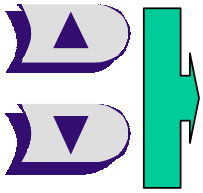
Text	Colour	Meaning
ON	green	Relay operational
I >>	red	Instantaneous phase start-up
I >> t	red	Instantaneous phase tripping
I >	red	Timed phase start-up
I > t k	red	Timed phase tripping
I$_{\perp}$>>	red	Instantaneous neutral start-up
I$_{\perp}$>> t	red	Instantaneous neutral tripping
I$_{\perp}$>	red	Timed neutral start-up
I$_{\perp}$> t k	red	Timed neutral tripping

These LED's also serve as indicators at various points during the execution of user interface menus via the keyboard and the display units. The relevant indications are listed in point 7.3 (Menu Sequence) below.

7.2.- Keyboard Functions

There are 6 keys, with the following functions:

USE THIS KEY TO EXIT ANY MENU.
THIS ALWAYS RETURNS TO THE INITIAL STATUS, WITH A PROMPT ASKING WHETHER YOU WANT TO STORE THE FIGURES ENTERED IN THE MEMORY IN MENUS WHERE PARAMETERS MAY BE CONFIGURED.



"**UP**" AND "**DOWN**" KEYS. USED TO SCROLL THROUGH MENU OPTIONS.

IN PARAMETER CONFIGURATION MENUS THESE KEYS INCREASE OR DECREASE THE RELEVANT FIGURES.
↳TO ACCEPT A FIGURE STRIKE ENTER.
↳WHEN ENTER IS STRUCK THE FOLLOWING MENU OPTION APPEARS.

"**ENTER**". USED TO SELECT A MENU AND ACCEPT A FIGURE.

"**RESET**". USED TO RESET AN LED FAULT INDICATION.
In the CONFIGURATION menu this key is used in setting currents and times to change the digit to be set (decimals, units,etc.).

"**TEST**". USED TO SIMULATE A FAULT AND CHECK THE RELAY. ALL 4 TRIP LED'S LIGHT UP AND THE SCREEN MESSAGE "FALT" APPEARS. THE RELAY WILL BE BLOCKED WHILE THIS KEY IS PRESSED. THIS KEY DOES NOT ACT IF THE RELAY IS TRIPPED.

7.3.- Relay Adjustment & Menu Sequence

The graphics below show the various relay menus, the information appearing on screen and how to set the parameters (adjust) the relay.

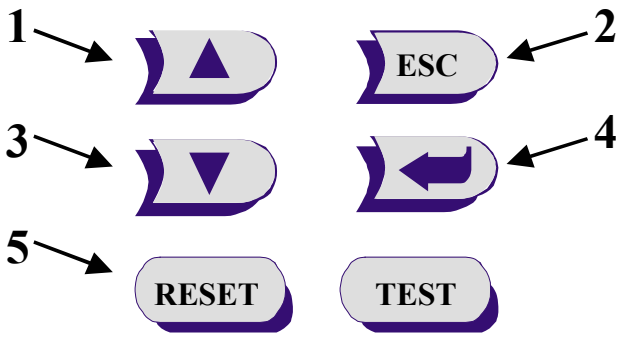
With the relay operational, the measurement for phase "R" appears on screen. Those of the other phases and the neutral can be viewed sequentially via the Up and Down keys.

Level 1	Level 2	Level 3	Level 4	Level 5	Comentarios
R phase measur.					Phase R current measurement (secundary)
S phase measur.					Phase S current measurement (secundary)
T phase measur.					Phase T current measurement (secundary)
Earth measur.					Neutral current measurement (secundary)
	CONFIGURATION	**PASSWORD**	**INSTANTANEOUS**	**PHASE O/C**	Phase Inst. OverCurrent protection (50)
				SETTING I>>	Instantaneous phase setting
				TIME	Delay time setting
				NEUTRAL O/C	Neutral OverCurrent protection (50N)
				SETTING Ie>>	Instantaneous neutral setting
				TIME	Delay time setting
			TIME CHARACTER.	**PHASE O/C**	Phase Time OverCurrent protection (51)
				SETTING I>	Phase current setting
				Time charateristic	Time Characteristic selection
				TIME	Delay time or curve setting
				NEUTRAL O/C	Neutral Time OverCurrent protection (51N)
				SETTING Ie>	Neutral current setting
				Time charateristic	Time Characteristic selection
				TIME	Delay time or curve setting
			Instantaneous disabled	**Disabled type**	Istantaneous trip disabled possibility
			RELAY	**RELAY 1**	Configuration first relay
				RELAY 2	Configuration second relay
				RELAY 3	Configuration thrid relay
			DIGITAL INPUT	**Configuration**	Digital input configuration
			FRECUENCY	**50/60 Hz**	Frecuency setting (analogic inputs)
			COMUNICATIONS	**DIRECTION**	Relay identity number
				SPEED	Communication speed

Nivel 1	Nivel 2	Nivel 3	Nivel 4	Nivel 5	Comentarios
	CONFIGURATION SIGHT	**INSTANTANEOUS**	**PHASE O/C**		Phase Inst. OverCurrent protection (50)
			SETTING I>>		Instantaneous phase setting
			TIME		Delay time setting
			NEUTRAL O/C		Neutral OverCurrent protection (50N)
			SETTING Ie>>		Instantaneous neutral setting
			TIME		Delay time setting
		TIME CHARACTER.	**PHASE O/C**		Phase Time OverCurrent protection (51)
			SETTING I>		Phase current setting
			Time charateristic		Time Characteristic selection
			TIME		Delay time or curve setting
			NEUTRAL O/C		Neutral Time OverCurrent protection (51N)
			SETTING Ie>		Neutral current setting
			Time charateristic		Time Characteristic selection
			TIME		Delay time or curve setting
		Instantaneous disabled	**Disabled type**		Istantaneous trip disabled possibility
		RELAY	**RELAY 1**		Configuration first relay
			RELAY 2		Configuration second relay
			RELAY 3		Configuration thrid relay
		DIGITAL INPUT	**Configuration**		Digital input configuration
		FRECUENCY	**50/60 Hz**		Frecuency setting (analogic inputs)
		COMUNICATIONS	**DIRECtION**		Relay identity number
			SPEED		Communication speed
	MEASUREMENT	**LEVEL 1**			Instantaneous measuring information (secondary)
	TEST	**EXECUTION**			Secuential test proccess of Led's and display
	PASSWORD	**OLD PASSWORD**			Change password
		NEW PASSWORD			Write new password
		REP. NEW PASSWORD			Repeat new password

- To change from one screen to the next in the same level, you must push "Down" button, or "Up" button to go to the previous one.
- To change the level to the next, you must push "INTRO" button.
- If we push "INTRO" in screen "Configuration" the relay ask for a Password. If the password is correct you pass to the first screen of the fourth level. You must push "Down" button to go to the next screen or "Up" button to go to the previous one. In this level it is possible to change the settings, apearing secuentially the different possible settings screens.
- To Confirm the settings you must push "ESC" button. In the screen appears the message "VALID?". Push "INTRO" to confirm or "ESC" to mantein the old settings.
- When one of the setting digits were blinking, it is possible to change its value pushing "Up" or "Down" buttons. To change the digit, you must push "RESET".
- Appendix III shows the different screens of the different menus, secuentially as a summary.

The relay keys are associated with the following numbers which are used in password allocation.

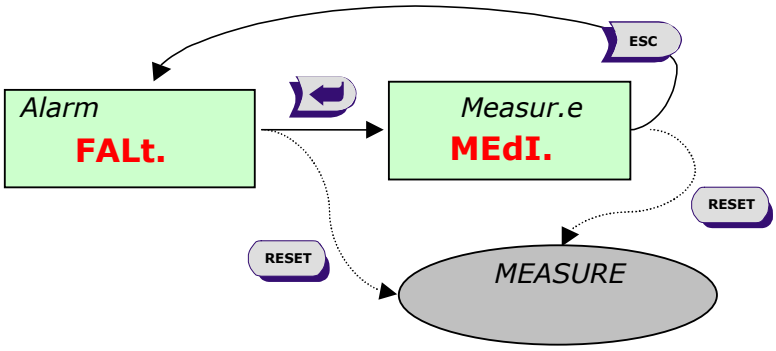


NB:
When RV protection relays leave the factory the password is set at 1111

7.4.- ALARM SCREEN

When a fault occurs, the relay display jumps from the menu displayed to the alarm screen.

- The relevant LED flashes (I>> o I> o I⏚>> o I⏚>).
- The screen message **FALt.** appears. Strike ENTER and use the Up and Down keys to check the current levels at the time of the fault. The menu is identical to the Instantaneous Measurement menu, except that the LED for the fault flashes.
- To revert to initial status strike RESET.



All menus except Instantaneous Measurements have a 90-second time-out. After that time the unit reverts to its initial status. In Fault Measurements the time-out is 60 seconds.

7.5.- Communication Problems

Using the software of the RV protections to communicate with them via **RS232** or **RS485**, it is posible to have some communication problems that software detects, showing an explicative message.

The software also detects the setting errors.

Next table presents the more common error messages, describing them and giving some indications for its solution.

Error message	Problem description	Possible cause	Solution
Failure in communication steup	It is no possible to communicate with RV relay	1. No RV connected. 2. Communication port not correctly defined	3. Connect the RV relay. 4. Configurate communication port
Setting is out of bounds.	It is no possible to set the value.	1. The setting is out of the setting range of the RV relay.	1. Change the setting to the closest included in the setting range. Consult User Manual.
Wrong password format.	It is no possible to change settings or change passcode.	1. Some or al the values are out of range (1 ÷ 5). 2. Some or all of the values have incorrec format.	1. Write correct password. 2. Write correct password.

It is able to have some COMMUNICATION FAILURES when try for ASKING FOR IDENTIFICATION or SENDING OF SETTINGS between relay and RV software. These messages are complete with an error code as follows:

Error code	Problem description	Possible cause	Solution
Time out	It is no possible to establish communication between relay and SW because of general communicaction failure.	1. The relay is not connected. 2. There is an incorrect connection. 3. Communication port not correctly defined. 4. Incorrect relay address.	1. Connect the relay. 2. Check communication cable. 3. Configurate communication port. 4. Correct relay address.
Ilegal datta address	It is no possible to establish communication with relay desired	1. It is chosen an incorrect RV protection family.	1. Chose RV protection family of the protection relay we need to communicate.
Ilegal data value	It is no possible to change the settings.	1. The passcode is not of the protection relay you desire to communicate.	1. Write correct passcode.

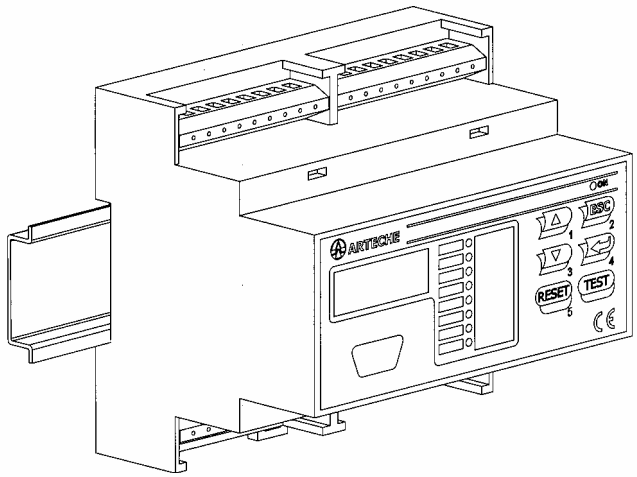
Do not hesitate in contact with us if you can not connect with the RV protection relay. Please send a mail to rv@arteche.es with the reference "**Error RV**".

Our technical department contact you in a short period of time in order to solve the problem.

8.- CONSTRUCTION FEATURES

The **RV-I** protection relay is supplied in a NORYL self-extinguishing plastic case compliant with standard UL-94, class V0.

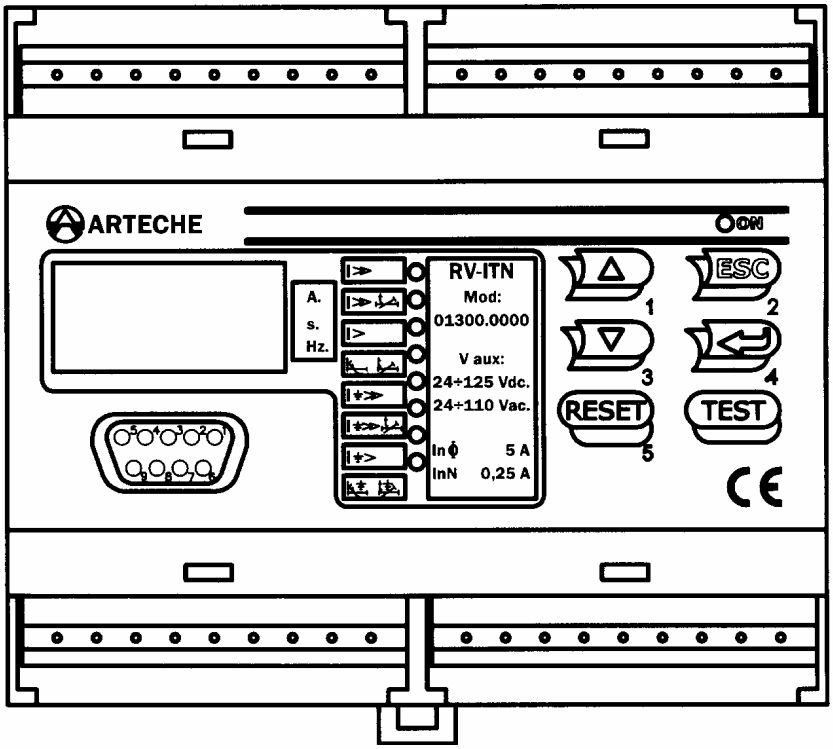
The box is RAL 7035 grey, and is designed to be installed on a DIN EN 50022 rail as per DIN 43880.



9.- POSITION OF EXTERIOR TERMINALS

Connector 1
1 2 3 4 5 6 7 8 9

Connector 2
10 11 12 14 15 16 17



19 20 21 22 23 24 25 26 27
Connector 3

28 29 30 32 33 34 35
Connector 4

PIN	Connector 1	RV-ITN	RV-IBN	RV-IT	RV-IMA
1	GND, RS485	X	X	X	X
2	RS485 B (negative) communication pair	X	X	X	X
3	RS485 A (positive) communication pair	X	X	X	X
4	+5 Vdc, RS485	X	X	X	X
5	Digital input (negative)	X	X	X	X
6	Digital input (positive)	X	X	X	X
7	Output relay 2 - COMMON	X	X	X	X
8	Output relay 2 - NC (normally closed)	X	X	X	X
9	Output relay 2 - NO (normally open)	X	X	X	X

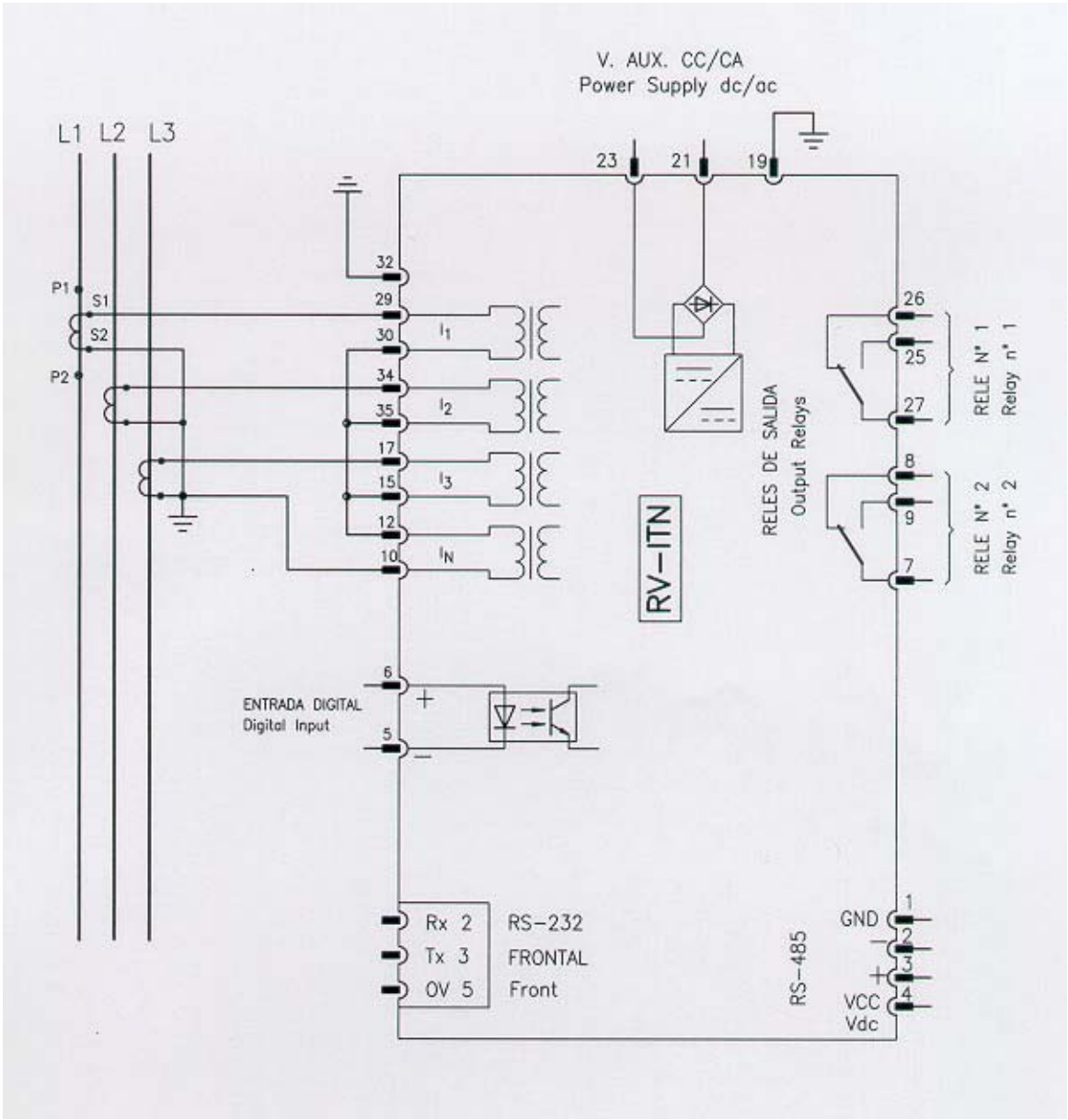
PIN	Connector 2	RV-ITN	RV-IBN	RV-IT	RV-IMA
10	Current input 4, output	X	X		X
10	Output relay 3 – Common			X	
11	Output relay 3 – NC (normally closed)			X	
12	Current input 4, input	X	X		X
12	Output relay 3 – NO (normally open)			X	
15	Current input 3, output	X		X	
17	Current input 3, input	X		X	

PIN	Connector 3	RV-ITN	RV-IBN	RV-IT	RV-IMA
19	Ground	X	X	X	X
21	Vdc or Vac (Aux. power supply without polarity)	X	X	X	X
23	Vdc or Vac (Aux. power supply without polarity)	X	X	X	X
25	Output relay 1 - NO (normally open)	X	X	X	X
26	Output relay 1 – NC (normally closed)	X	X	X	X
27	Output relay 1 – COMMON	X	X	X	X

PIN	Connector 4	RV-ITN	RV-IBN	RV-IT	RV-IMA
29	Current input 1, input	X	X	X	
30	Current input 1, output	X	X	X	
32	Ground	X	X	X	X
34	Current input 2, input	X	X	X	
35	Current input 2, output	X	X	X	

10.- EXTERNAL CONNECTIONS

3 phase + neutral **RV-ITN** (standard connection)



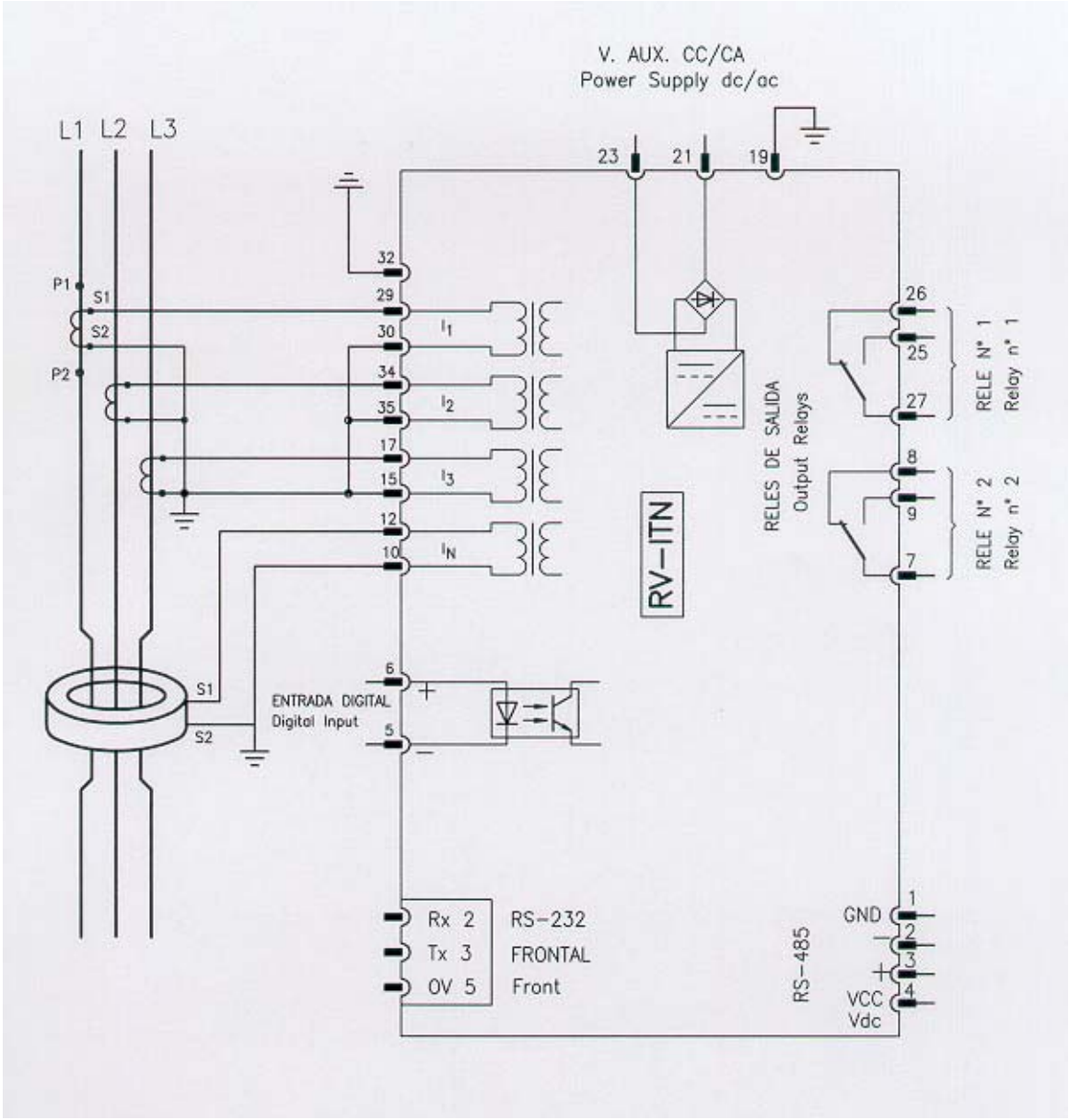
Output contacts programmable by the user.

The units leave the factory programmed as follows:

Relay nº 1: General trip.

Relay nº 2: ALARM: Relay Not Operational.

3 phase + neutral **RV-ITN** (sensitive ground)



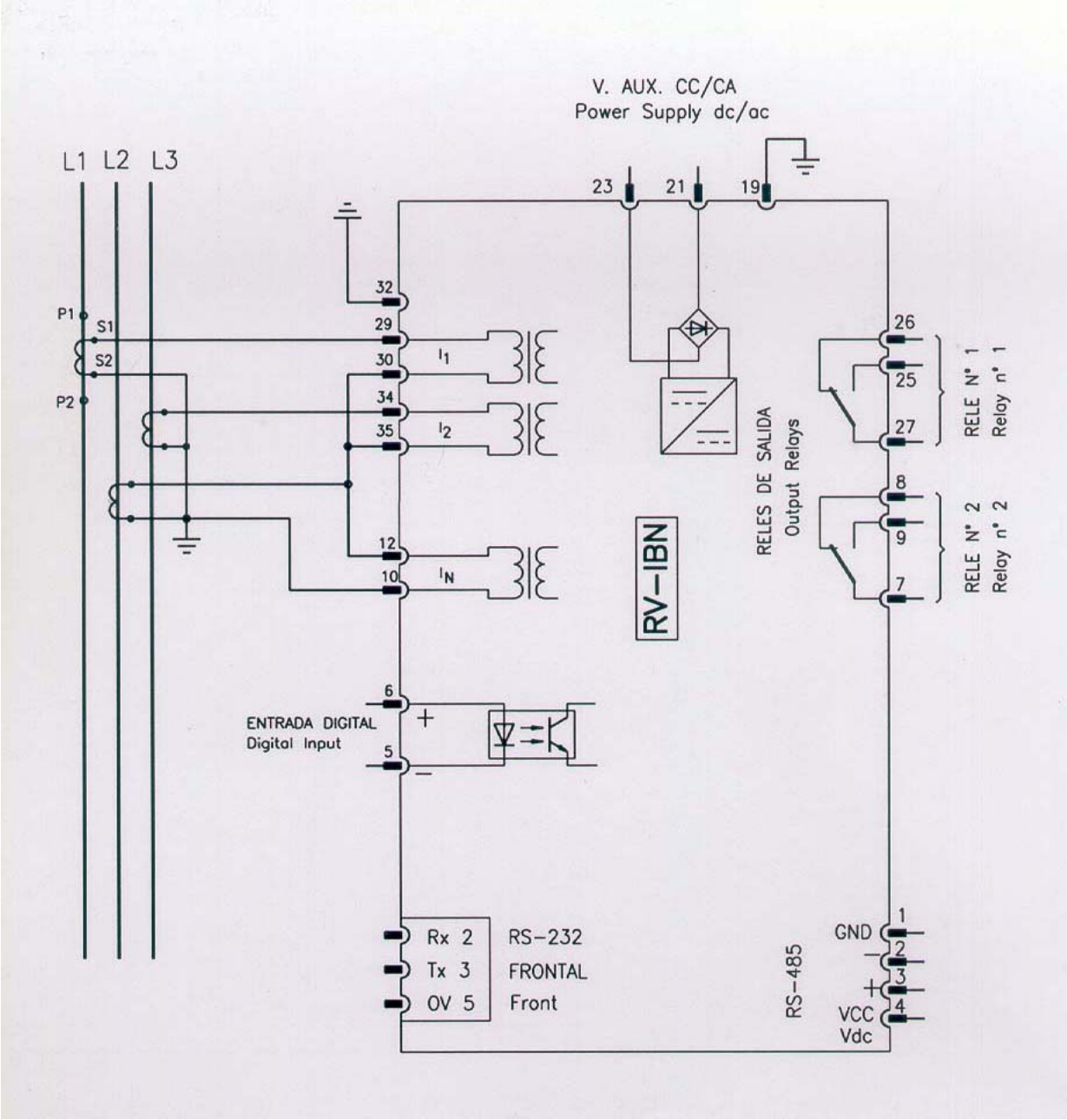
Output contacts programmable by the user.

The units leave the factory programmed as follows:

Relay nº 1: General trip.

Relay nº 2: ALARM: Relay Not Operational.

3 phase + neutral **RV-IBN** (standard connection)



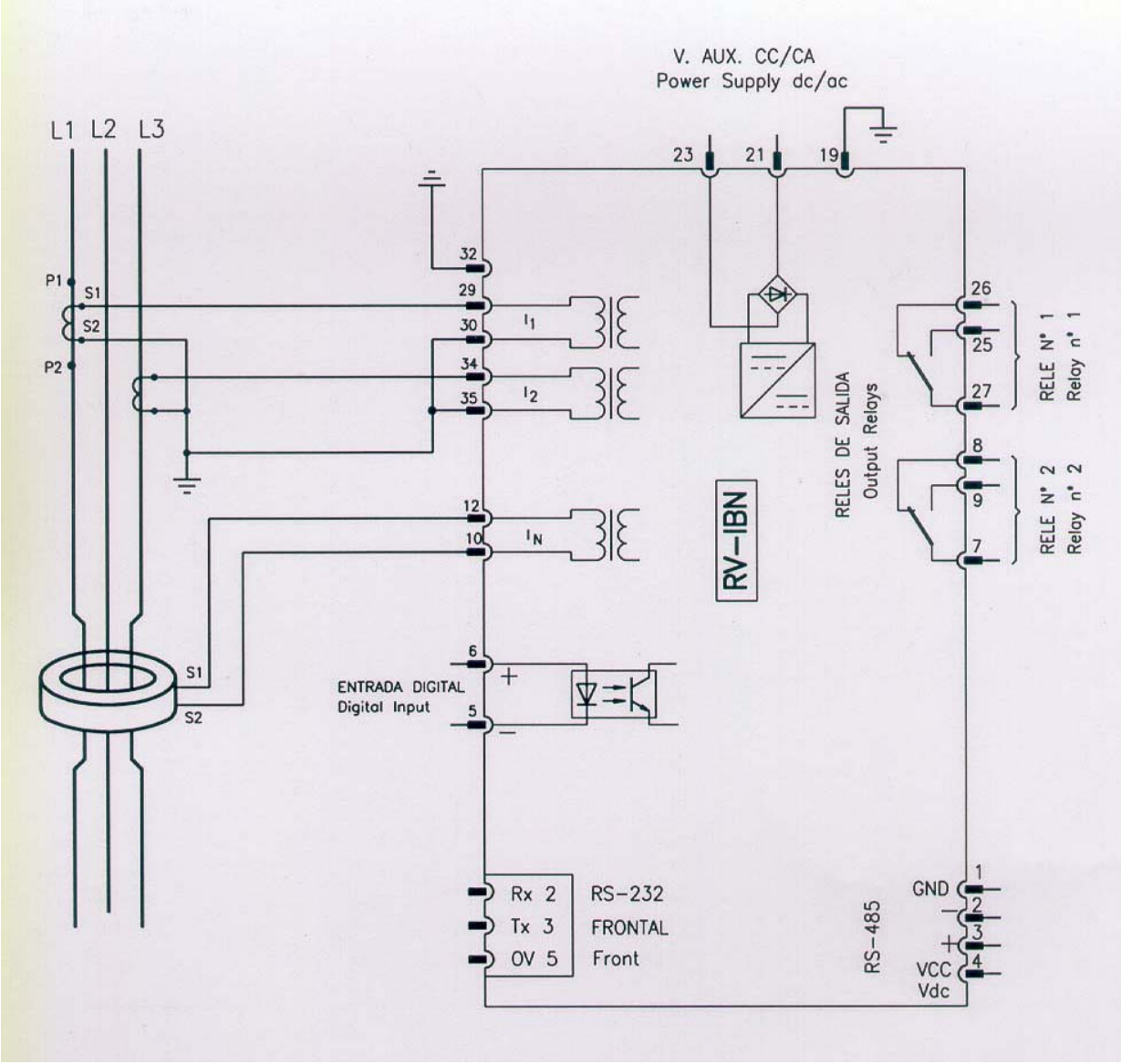
Output contacts programmable by the user.

The units leave the factory programmed as follows:

Relay nº 1: General trip.

Relay nº 2: ALARM: Relay Not Operational.

3 phase + neutral **RV-ITN** (sensitive ground)



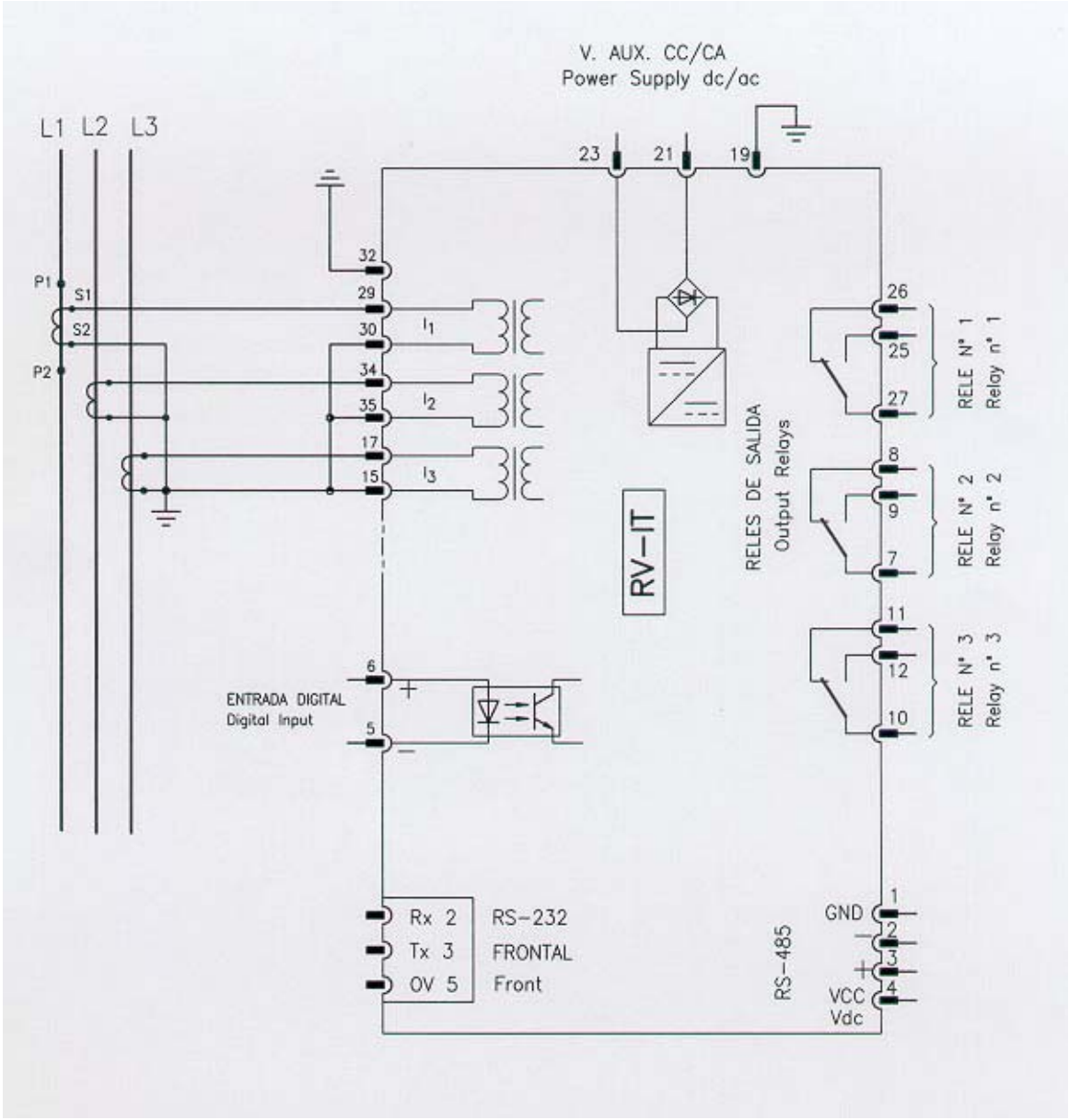
Output contacts programmable by the user.

The units leave the factory programmed as follows:

Relay nº 1: General trip.

Relay nº 2: ALARM: Relay Not Operational.

3 phase **RV-IT** (standard connection)



Output contacts programmable by the user.

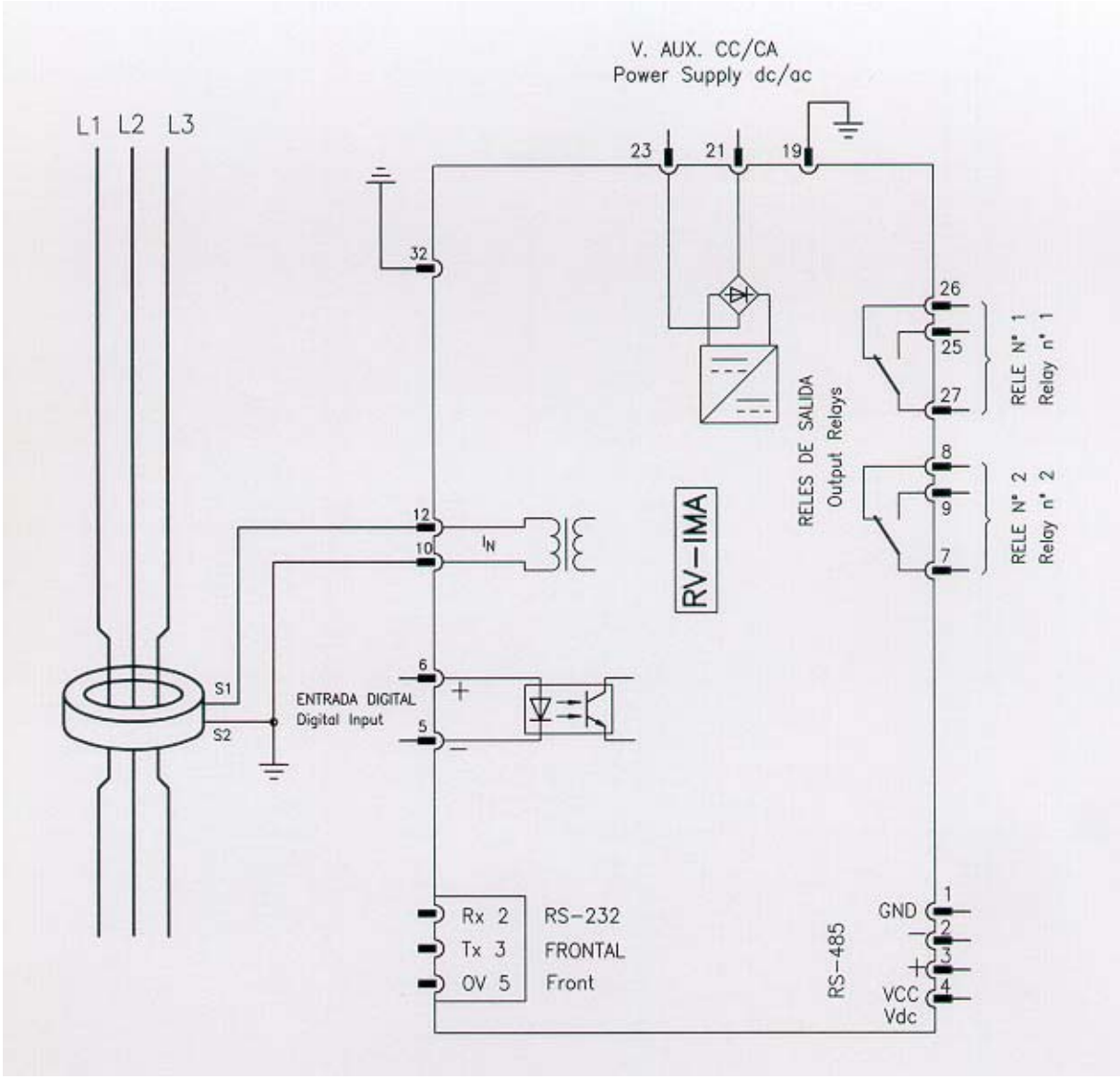
The units leave the factory programmed as follows:

Relay nº 1: General trip.

Relay nº 2: ALARM: Relay Not Operational.

Relay nº 3: Phase start-up.

Single phase w/ armonic filter **RV-IMA** (standard connection)



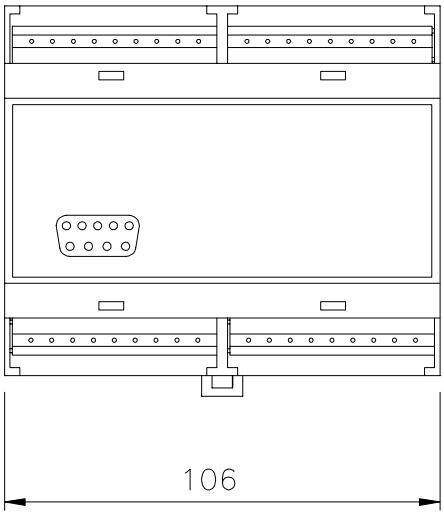
Output contacts programmable by the user.

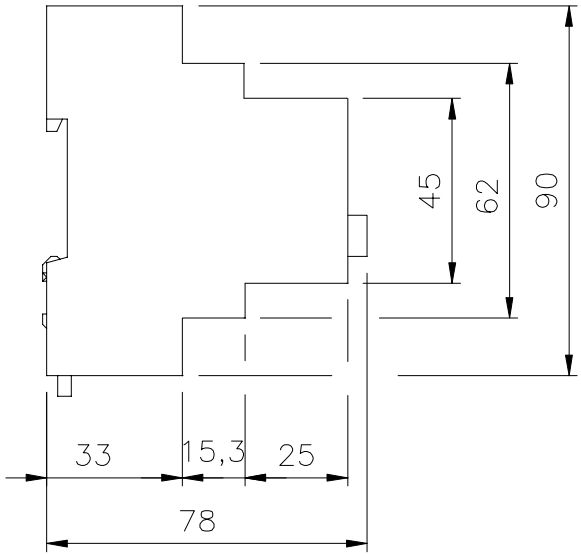
The units leave the factory programmed as follows:

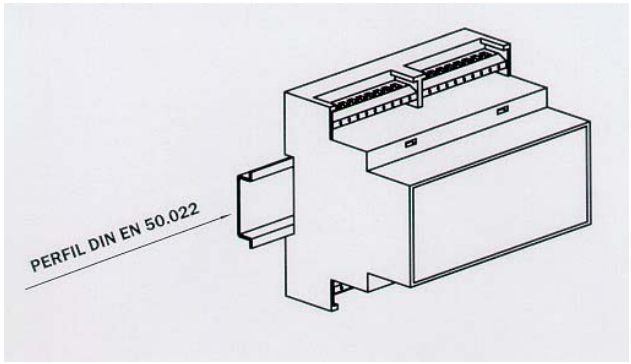
Relay nº 1: General trip.

Relay nº 2: ALARM: Relay Not Operational.

11.- OUTSIDE DIMENSIONS







APPENDIX I: MODEL SELECTION TABLE

MODEL **R V - X X X X . X X X 1 0 . 0 0 0 0**

FUNCTION	
Overcurrent – 3 phases + neutral	_ I T N
Overcurrent – 3 phases	_ I T _
Overcurrent – 2 phases + neutral	_ I B N
Overcurrent – single phase w/ filtering of harmonics	_ I M A

AUX. POWER SUPPLY (± 20%)		
POWER SUPPLY	DIG. INPUTS	
24 ÷ 125 Vdc / 24 ÷ 110 Vac	24 ÷ 125 Vdc	0
90 ÷ 250 Vdc / 80 ÷ 230 Vac	90 ÷ 250 Vdc	1

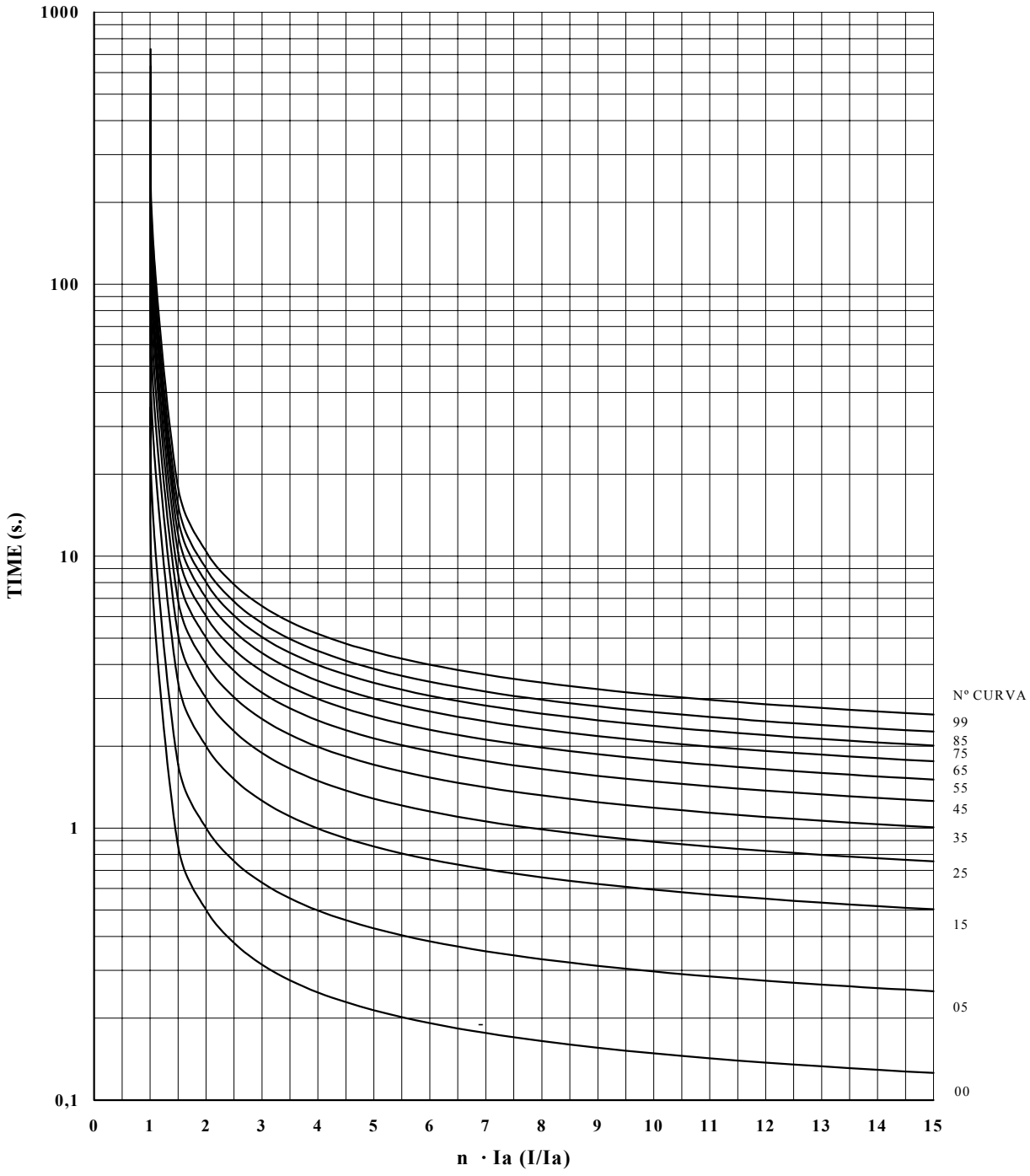
PHASE RATED CURRENT	
No current	0
5 A	1
1 A	2
0.25 A	3
0.1 A	4

NEUTRAL RATED CURRENT	
No current	0
5 A	1
1 A	2
0.25 A	3
0.1 A	4
0.01 A	5
0.01 A (s)	7

APPENDIX II: CHARACTERISTICS CURVES

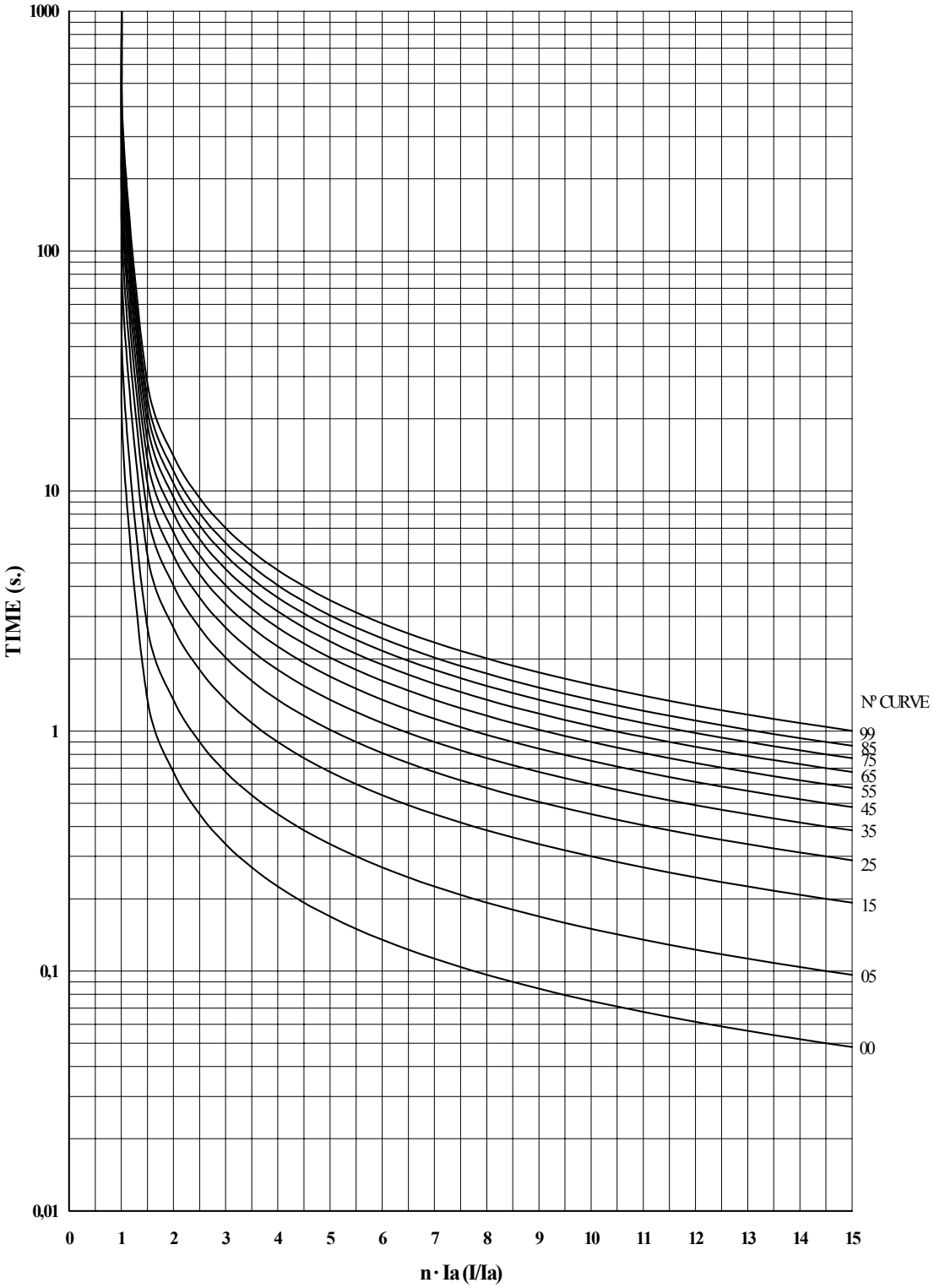
IEC-60255 / BS-142

CURVE A / INVERSE

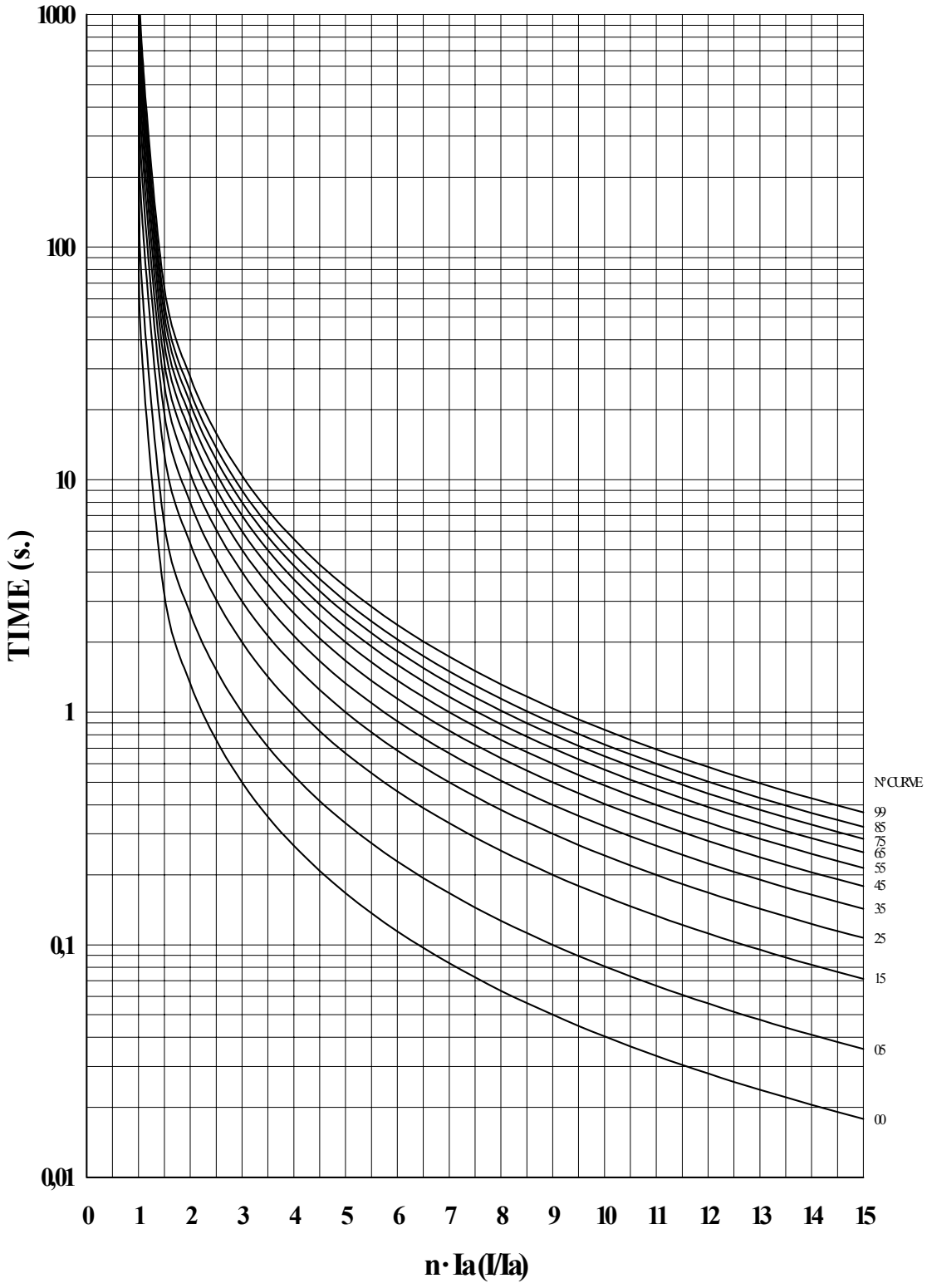


IEC-60255 / BS-142

CURVE B / VERY INVERSE

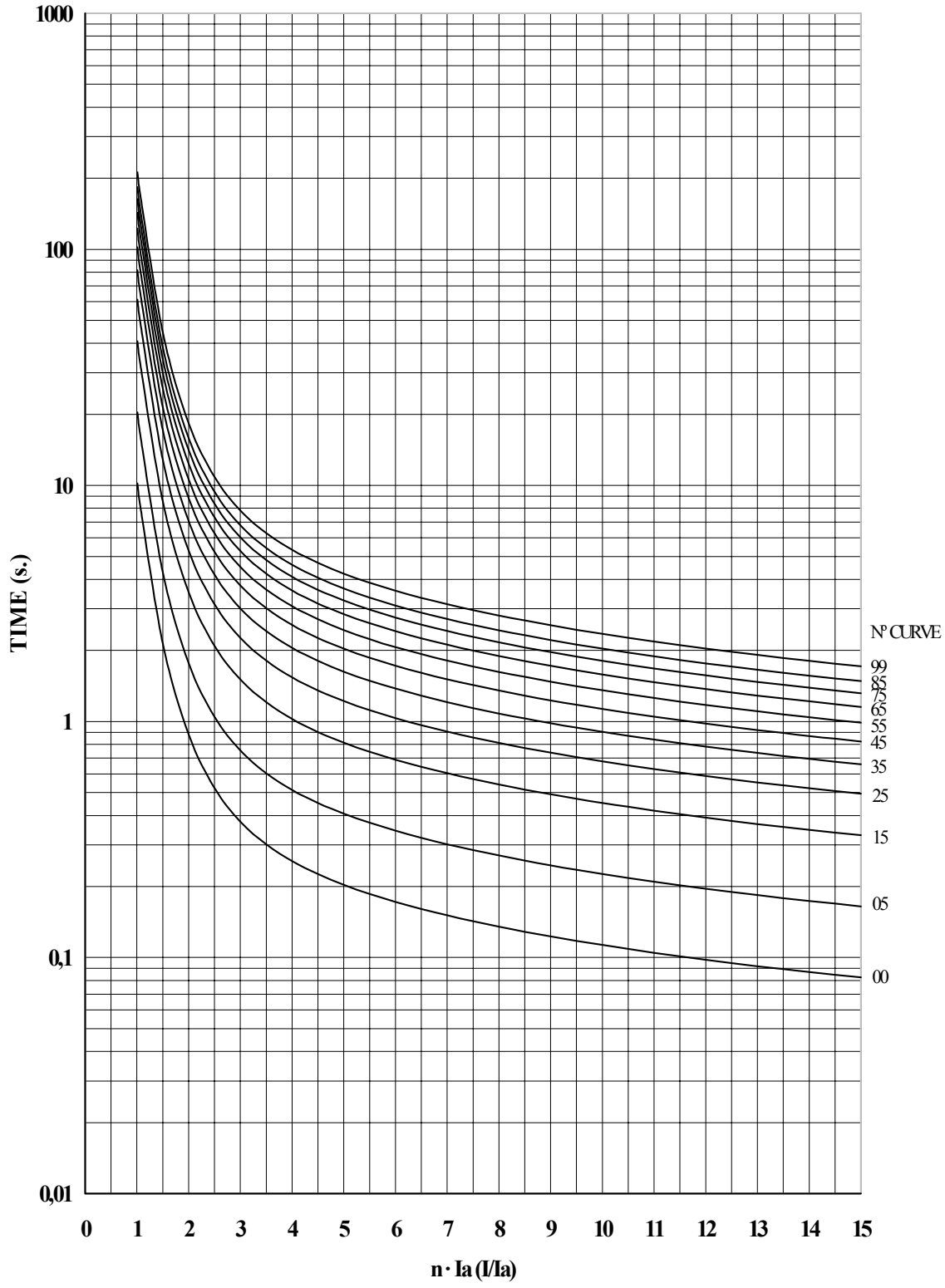


IEC-60255 / BS-142
CURVE C / EXTREMELY INVERSE



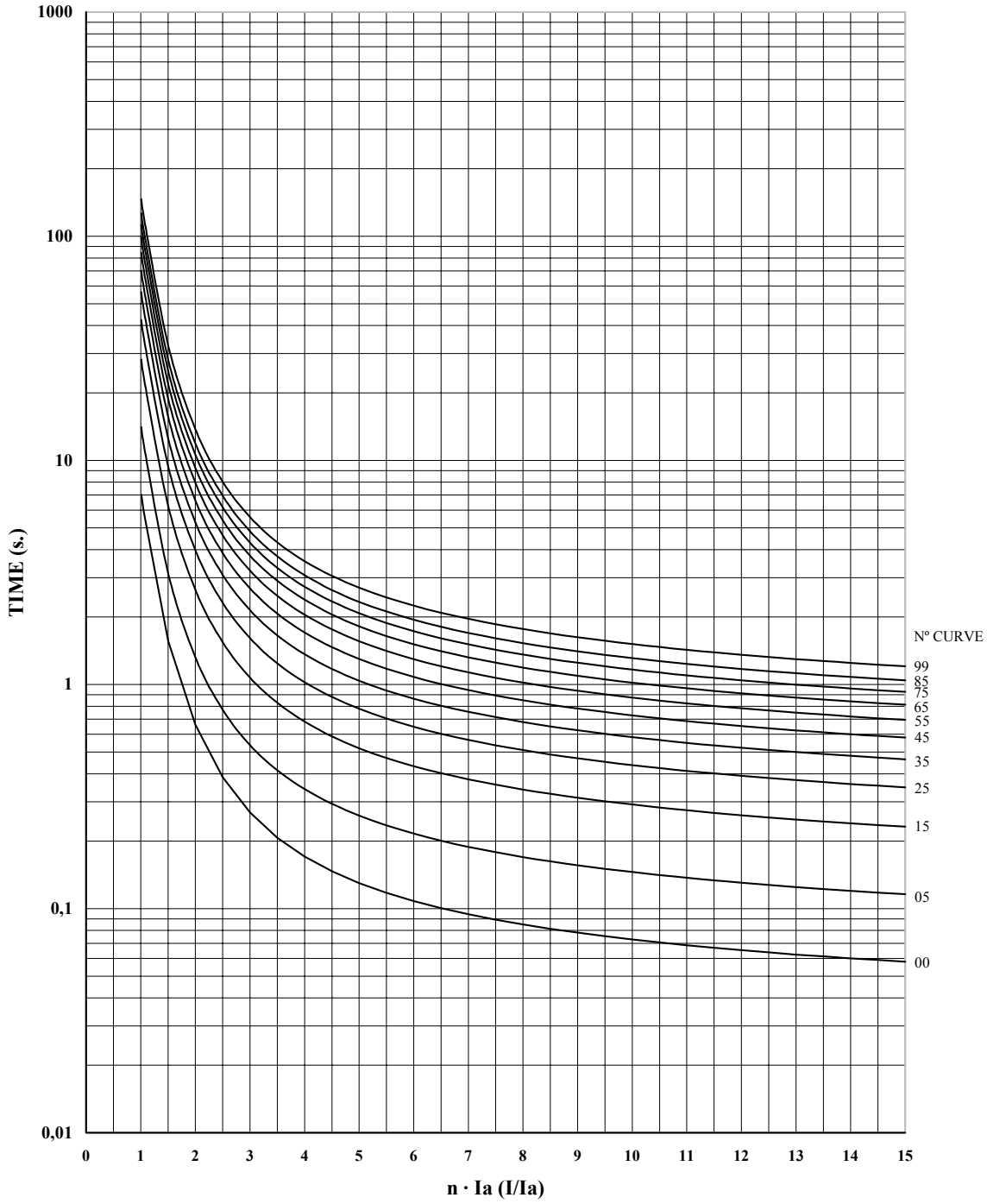
ANSI / IEEE C 37-2

CURVE INVERSE



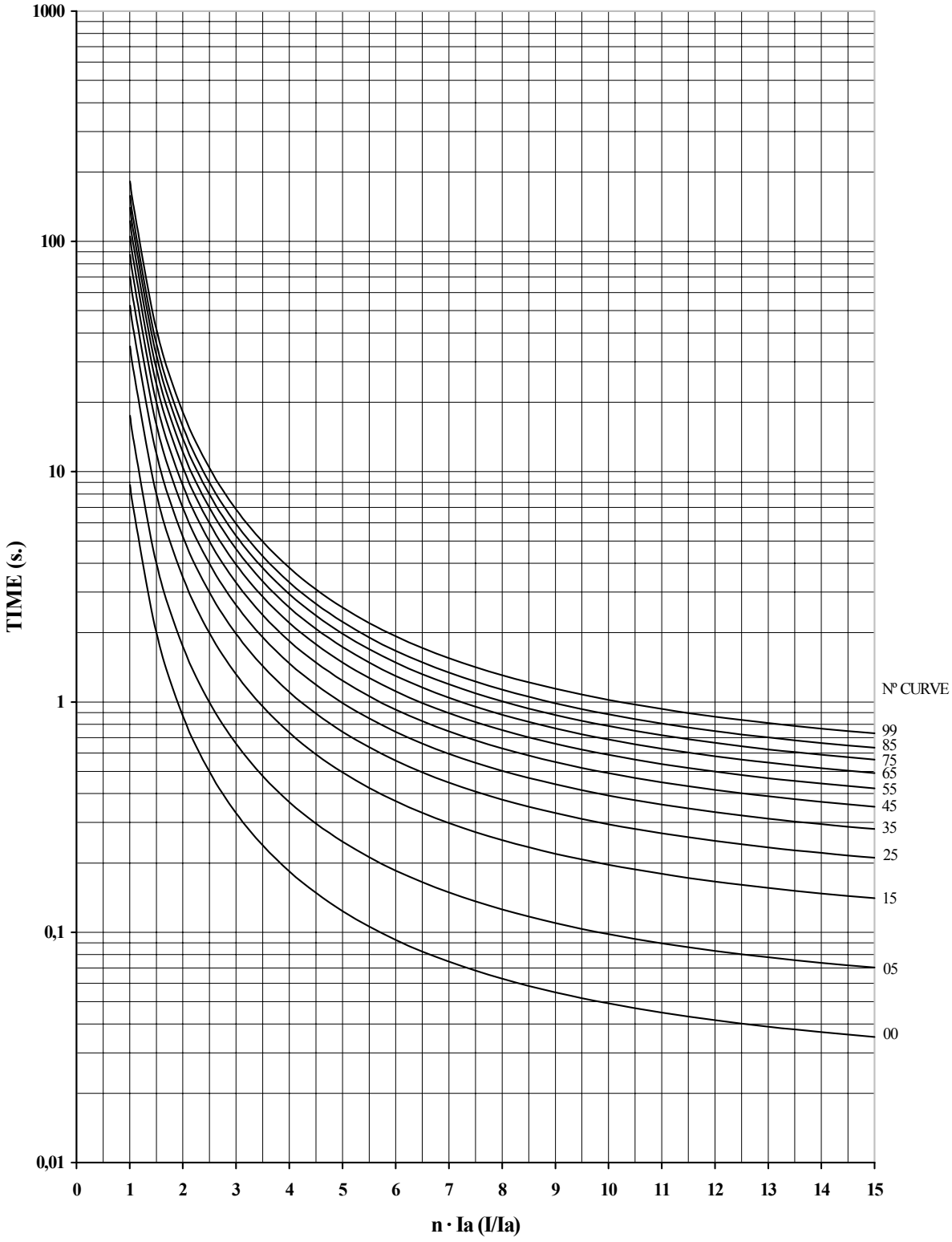
ANSI / IEEE C37-2

CURVE VERY INVERSE

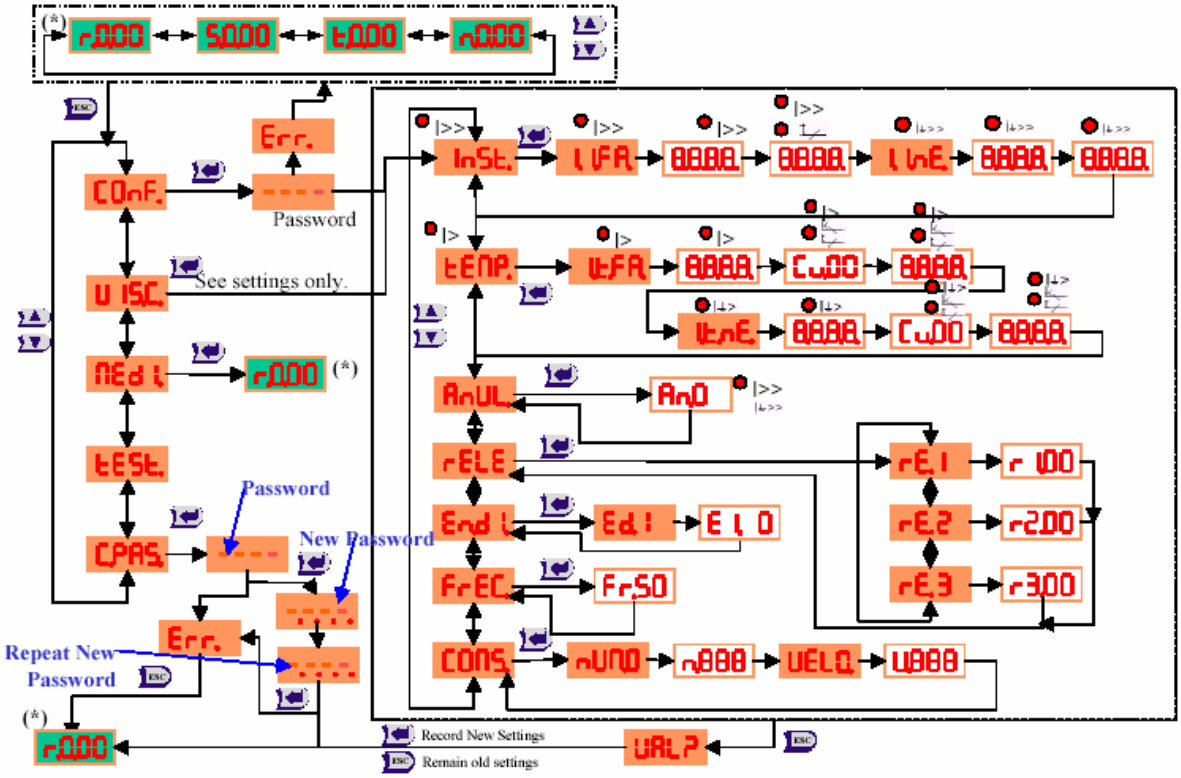


ANSI / IEEE C37-2

CURVE EXTREMELY INVERSE



APENDIX III: OPERATING GUIDE LINE



In the menu, COnF. the key RESET is used to change the digit (Units; tens;...) of the setting we are adjusting (current, time,...).

Phase instant.. setting (50).

Neutral instant. setting (50N).

Current rated	Range	Adjust steps	Current
5 A	0.5÷60 A	0.1 A	Phase & Neutral
1 A	0.25÷15 A	0.01 A	Phase & Neutral
0.25 A	0.05÷3 A	0.01 A	Phase & Neutral
0.1 A	0.02÷1.5 A	0.01 A	Phase & Neutral
0.01 A	0.004÷0.035	0.001 A	Neutral
0.01 A (s)	0.005÷0.10	0.001 A	Neutral

Phase time setting (51).

Neutral time setting (51N).

Current rated	Range	Adjust steps	Current
5 A	0.5 ÷ 12 A	0.1 A	Phase & Neutral
1 A	0.25 ÷ 3 A	0.01 A	Phase & Neutral
0.25 A	0.05 ÷ 1 A	0.01 A	Phase & Neutral
0.1 A	0.02÷0.3 A	0.01 A	Phase & Neutral
0.01 A	0.004÷0.02	0.001 A	Neutral
0.01 A (s)	0.005÷0.03	0.001 A	Neutral

- CuO0 Inverse characteristic curve.
- CuO1 Very Inverse charact. curve.
- CuO2 Extremely Inverse charact. curve.
- CuO3 Definite time characteristic.
- CuO4 User Curve (option).

Phase and neutral definite time setting:
(0÷12 s; step 0.1 s)
K: Curve constant selected

Phase & Neutral additional time setting:
(0÷2 s; step 0.01 s)

- AnO An.0: All functions operative
  An.1: Phase functions disabled
  An.2: Neutral functions disabled
  An.3: Phase & Neutral functions disabled
- E t O E1. 0: Disabled
  E1. 1: Trippings disabled
  E1. 2: Fault signal reset.
- r tOO / r2OO / r3OO
  00: Not operative
  01: General trip
  02: Instant. phase tripping
  03: Instant. neutral tripping
  04: Time phase tripping
  05: Time neutral tripping
  06: Phase function start
  07: Neutral function start
  08: Instantaneous cancelation
  09: Phase tripping (I>> o I>)
  10: Neutral tripping (I>> o I>)
  11: Instantaneous tripping
  12: Time tripping
  13: Alarm, relay not operative
- FrSO 50 Hz
- Fr60 60 Hz
- nOOO Identity number of the realy choosen between 1 and 240.
- UOOO U. 4.8: 4800 bauds
  U. 9.6: 9600 bauds
  U.19.2: 19200 bauds